

# PATENT SPECIFICATION



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## PROVISIONAL SPECIFICATION

### An Electrode Arrangement Suitable for Resistance Welding

We, THE ENGLISH ELECTRIC COMPANY LIMITED, a Company registered under British Law, of Queen's House, 28, Kingsway, London, W.C.2, HENRY GEORGE NELSON, a British Subject of 59, Arlington House, Arlington Street, London, S.W.1, and HORACE INSTONE, a British Subject, of Dick Kerr Works, Preston, Lancashire, do hereby declare the nature of this invention to be as follows:—

This invention relates to a device which can be fitted to or incorporated in an electric spot welding or like machine to give the effect of a repeatedly renewable working tip for the electrodes of such machines; the arrangement thus results in effect in an everlasting electrode eliminating the regular cleaning required of the electrodes more particularly when welding light alloys, preventing the marking of the material being welded and lastly preventing electrodes from losing their correct contour or shape due to continual cleaning.

According to the invention the working tip of the electrode is covered by a strip or band which can be drawn across the electrode and which forms the actual contact surface; this strip can be moved along by a specified distance after each weld thereby bringing a clean portion of the strip between the electrode and the work for each succeeding weld. If desired the strip can be moved automatically—e.g. in response to the movement of the welding head.

The undesirable effect known as "pick-up" which consists in a tendency for the electrode to weld to the work and for some of the metal of the work being welded to be accordingly picked up and carried away by the tip of the electrode as it is withdrawn from the work, is generally considered to be due to a slight film of oxide being picked up by the electrode from the surface of the metal being welded owing to the heavy pressure being applied to the electrodes. Since the present invention provides a clean spot on the strip for each welding operation, any oxide film which adheres to the strip after one welding operation being moved away from the electrode before the next

welding operation, "pick-up" cannot occur.

The strip, which is preferably a very thin copper tape, can conveniently be attached to spools and during operation is unwound from one spool and wound on to the other. Tension is applied to the strip to keep it taut as it passes over the face of the electrode. The feeding motion of the strip may be effected by rotation of the spools step by step by ratchet mechanism.

In one particular arrangement the two spools are rotatably mounted about parallel axes transverse to the electrode axis and on opposite sides of the head. In the case of the upper electrode of a spot welding machine the copper tape or the like passes from one of the spools downwards around a guiding roller and then under the face of the electrode which is curved to form a surface for the loop of tape and preferably slightly channelled to retain the tape from slipping off the electrode. The other end of the tape passes upwards by way of another guiding roller to the other spool.

The arrangement for the lower head of a spot welding machine can be an inversion of that for the upper head.

In one particular method of rotating the spool on to which the tape is coiled this spool is driven through a free wheel device which is rotated in one direction by the downward movement of the head and in the other direction by the upward return movement; the free wheel slips during the downward movement but drives the spool during the upward movement. In a convenient form of drive a rack secured to and reciprocating with the welding head meshes with a pinion turning about a stationary axis; a pinion having more teeth and rotating with the first pinion meshes with a similar rack adapted to drive one side of the free wheel device which is accordingly moved through a distance corresponding to the difference between the traverse of the two racks. The tape is kept tight by spring means or the equivalent acting on the spool from which the tape is unwound. A similar arrangement on the lower weld-

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ing head can be actuated by the free wheel on the upper head through a racking shaft driven by a universal joint and driving the lower spool through the necessary intermediate gears and one or more intermediate shafts. Electrical insulation is of course incorporated in this mechanical connection to prevent direct elec-

trical connection between the upper and lower electrodes. 10

Dated this 14th day of January, 1944.

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### COMPLETE SPECIFICATION

#### An Electrode Arrangement Suitable for Resistance Heating or Welding

We, THE ENGLISH ELECTRIC COMPANY LIMITED, a Company registered under British Law, of Queen's House, 28, Kingsway, London, W.C.2. HENRY GEORGE NELSON, a British Subject, of 59, Arlington House, Arlington Street, London, S.W.1, and HORACE INSTONE, a British Subject, of Dick Kerr Works, Preston, Lancashire, do hereby declare the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to a device which can be fitted in or incorporated in an electric spot welding machine or other machine wherein electrode and work are repeatedly pressed together for a succession of resistance welding or heating operations. The purpose of the device is to give the effect of a repeatedly renewable working tip for the electrodes of such machines; the arrangement thus results in what is for practical purposes almost an everlasting electrode, eliminating the regular cleaning required of the electrodes, more particularly when welding light alloys, preventing the marking of the material being welded and lastly preventing electrodes from losing their correct contour or shape due to continual cleaning.

According to the invention the working tip of the electrode is covered by a thin layer of conducting material which can be moved step by step across the electrode and which material forms the actual contact surface; this material can be moved through a specified distance between two welds (or other heating operations) thereby bringing a clean portion of the material between the electrode and the work for each succeeding operation. Preferably the material is moved in automatic response to movement which brings the electrode into and out of contact with the work.

The undesirable effect known as "pick-up" which consists in a tendency for the electrode to weld to the work and for some

of the metal of the work being welded to be accordingly picked up and carried away by the tip of the electrode as it is withdrawn from the work, is generally considered to be due to a slight film of oxide being picked up by the electrode from the surface of the metal being welded owing to the heavy pressure being applied to the electrodes. Since the present invention provides a clean spot on the thin material for each welding operation, any oxide film which adheres to the thin material after one welding operation being moved away from the electrode before the next welding operation, "pick-up" cannot occur. 65 70 75

The thin material, which may be a very thin tape of copper or like metal and may be of one metal with a coating of another metal can conveniently be attached to spools and during operation is unwound from one spool and wound on to the other, the tape being kept taut as it passes over the face of the electrode. The feeding motion of the tape may be effected by rotation of the spools in steps through a free wheel device by the movement of the electrode in one direction. 80 85

The invention is illustrated by the accompanying drawings of which Fig. 1 shows a tape according to the invention movable across the upper and movable electrode of a spot welding machine as seen in front view. Fig. 2 is a side view of the same electrode and of the lower stationary but vertically adjustable electrode showing the mechanism for driving the spools but with the tape removed, Fig. 3 is an enlarged view corresponding to Fig. 1 showing one of the racks and Fig. 4 is an enlarged view corresponding to Fig. 1 and showing the other rack. 90 95 100

In this arrangement the spools 1 and 2 are secured to spindles 3 and 4 rotatably mounted about parallel axes transverse to the axis of electrode 5 and on opposite sides of the upper and downwardly movable head 6. A thin copper tape 7 (Fig. 1) is secured to and passes from the spool 1 downwards around a guiding roller 8 and then under the face of the electrode 5 105 110

which is curved to form a surface for the loop of tape and preferably slightly channelled (see Fig. 2) to retain the tape from slipping off the electrode. The other end 6 of the tape passes upwards by way of another guiding roller 9 to the spool 2.

The arrangement for the lower and normally stationary head can be an inversion of that for the upper head.

10 Secured to spindle 4 is the member 10a of a free wheel device of which the other member 10b is rotated in one direction by the downward movement of the head 6 and in the other direction by the upward 15 return movement; the free wheel slips during the downward movement but drives the spindle 4 and spool 2 during the upward movement. Secured to and reciprocating with the welding head 6 is a rack 11 (see Fig. 3) which meshes with a pinion 12 turning about a stationary 20 axis; a pinion 13 having more teeth than pinion 12 and rotating with the pinion 12 meshes with a rack 14 linked to and so adapted to drive the member 10b of the 25 free wheel device (as shown in Fig. 4) so that member 10a is accordingly moved through a distance corresponding to the difference between the traverse of the two racks. Thus the tape 7 is moved through- 30 out substantially the whole of the upward movement of the head 6 whereby gradual movement is imparted to the tape instead of an abrupt movement which might 35 impose severe stresses on the tape. The latter is kept taut by making both spools 1 and 2 require appreciable force to overcome friction and rotate them.

The similar arrangement on the lower 40 welding head 15 can be actuated by the spindle 4 on the upper head. Spindle 4 drives lower spool spindle 16 through rocking shafts 17, universal joints 18, longitudinally extensible couplings 19, 45 bevel gearing 20 carried by brackets 21 mounted on the upright frame 22 of the machine and vertical spindles 23 coupled by coupling 24; the latter incorporates 50 electrical insulation to prevent direct electrical connection between the upper and lower electrodes. The arrangement of universal joints 18 and couplings 19 55 permits of the up and down movement of the upper welding head 6 for each operation and also permits the lower welding head 15 with its supporting cantilever 25 to be adjusted up and down.

When the complete length of tape has been used once, the spools can be readily 60 removed from the spindles and put on again the reverse way round, so that the tape can be used a second time. The tape can be used many times before it need be discarded and a fresh tape attached to the 65 spools.

It will be understood how the arrangement described can be adapted to a machine wherein the work resting on the lower electrode is moved upwards to engage a stationary upper electrode. 70

Having now particularly described and ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:— 75

1. A contact electrode arrangement for an electric spot welding machine or other machine wherein electrode and work are repeatedly pressed together for a succession of resistance welding or heating 80 operations and wherein the working tip of the electrode is covered by thin conducting material movable step by step across the electrode, between successive operations, this thin material forming the 85 actual contact surface.

2. An electrode arrangement according to Claim 1 wherein said material is a thin metal tape.

3. An arrangement according to Claim 90 1 or Claim 2 including means for moving said material a predetermined distance between operations, in automatic response to movement which brings the electrode 95 into or out of engagement with the work.

4. An electrode arrangement according to Claim 2 wherein said tape after coming from the electrode is coiled on a rotatable spool.

5. An arrangement according to Claim 100 4 with a movable electrode including means for driving said spool, through a free-wheel device, by the movement which brings the electrode into or out of engagement with the work. 105

6. An arrangement according to Claim 5 wherein said free wheel drives the spool during separation of electrode and work but can slip during the movement of approach. 110

7. An arrangement according to Claim 5 or Claim 6 wherein the spool is driven substantially throughout the greater part of the said movement in one direction.

8. An arrangement according to Claim 115 7 including a first toothed rack secured to the part which carries the electrode and spool, a first pinion meshing with said rack and adapted to be driven thereby due to the approach and separation of electrode and work, a second and larger pinion 120 rotating with the first pinion and a second rack meshing with the second pinion and linked to the free-wheel device so that relative longitudinal movement of the two 125 racks drives the spool through the free wheel.

9. An arrangement according to any of the Claims 4—8 applied to each of a pair of opposed electrodes, the first of which is 130

stationary and the second movable towards and away from the first, wherein the movement of the second electrode drives the spool associated therewith and  
5 also the spool associated with the first electrode.

10. A contact electrode arrangement

substantially as described with reference to the accompanying drawings.

Dated this 22nd day of January, 1945.

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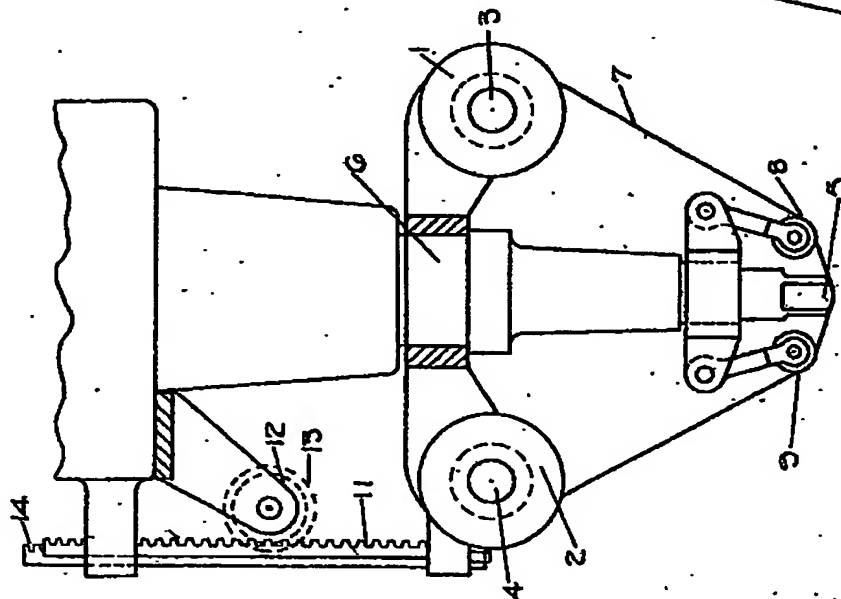


FIG. 1.

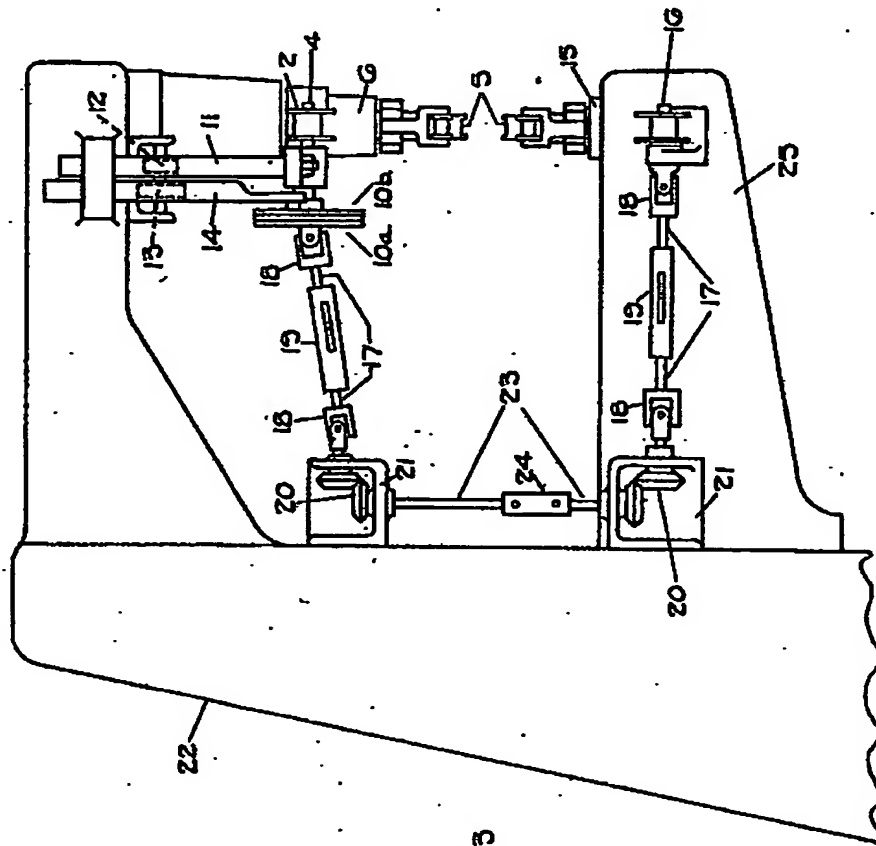


FIG. 2.

FIG. 2.

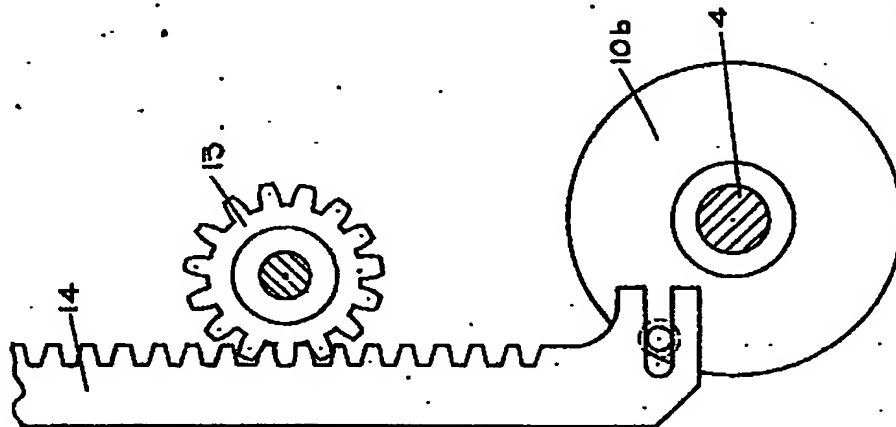


FIG. 4.

FIG. 1.

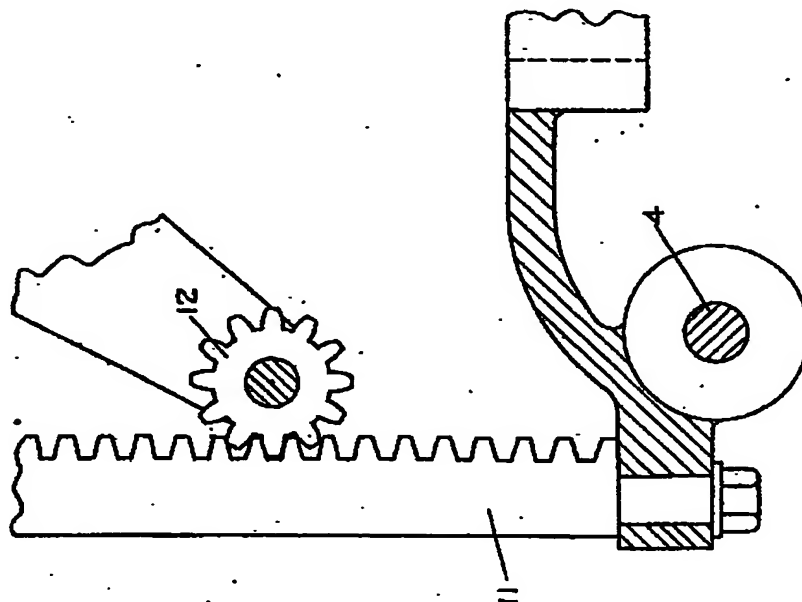


FIG. 3

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